APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
BADER, ROBERT N.

ART UNIT	PAPER NUMBER
2628	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

	Application No.	Applicant(s)
Office Action Summary	10/790,904	MITCHELL ET AL.
	Examiner	Art Unit	
	ROBERT BADER	2628	

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on <u>10 June 2010</u>.

2a) ☐ This action is **FINAL**.   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) <u>2,3,5,6,11-16,20 and 21</u> is/are pending in the application.

   4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) <u>2,3,5,6,11-16,20,21</u> is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.

   Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

   Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   a) ☐ All   b) ☐ Some * c) ☐ None of:

   1. ☐ Certified copies of the priority documents have been received.

   2. ☐ Certified copies of the priority documents have been received in Application No. _____.

   3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

   * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1.   This Office Action is in response to the Applicants' communication filed on

6/10/10. In virtue of this communication, claims 2, 3, 5, 6, 11-16, 20, and 21 are

currently presented in the instant application.

Continued Examination Under 37 CFR 1.114

2.   A request for continued examination under 37 CFR 1.114, including the fee set

forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this

application is eligible for continued examination under 37 CFR 1.114, and the fee set

forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action

has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 6/10/10

has been entered.

Claim Rejections - 35 USC § 102

3.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in
> public use or on sale in this country, more than one year prior to the date of application for patent in
> the United States.

4.   Claims 21, 2, 3, 5, and 6 are rejected under 35 U.S.C. 102(b) as being

anticipated by US Patent 6,259,461 B1 (hereinafter **Brown**).

Regarding claim 21, the limitation "a method for object based visibility culling

performed by an apparatus that performs graphics processing" is taught by Brown (col

3, lines 36-56, "The method operates in a computer graphics system having an
application program that interfaces through an application program interface (API) to a
graphics pipeline, including a rendering pipeline and a frame buffer. The method
includes the step of providing a visibility flag that is in communication with the
application program to relay rendering information to the application program. The
method clears (or resets) the visibility flag upon sending new data to the rendering
pipeline, and sets the visibility flag if data sent to the rendering pipeline from the
application program is further communicated to the frame buffer for display. Thereafter,
the method evaluates the visibility flag from within the application program after a first
pass of a first segment of graphics data has been rendered by the rendering pipeline. If
the visibility flag was not set during the first pass, then the application program inhibits
the rendering of subsequent passes of the first segment of graphics data. If, however,
the visibility flag was set during the first pass, then the application program will send
subsequent passes of the graphics data to the rendering pipeline for processing and
display.")

The limitation "receiving a plurality of draw packets" is taught by Brown (as
indicated in the section quoted above, graphics data is broken up into segments, i.e. the
first segment, and others)

The limitation "comparing each of the plurality of draw packets to a bounding
volume object, wherein the bounding volume object is a low resolution geometric
representation of a specific object identified as geometry whose visibility status is
desired" are taught by Brown (col 7, lines 13-25, "In similar fashion, when an application

program 102 is configured to display a graphics scene that requires the rendering of

relatively complex (i.e., computationally extensive) graphics shapes or objects, the

application program 102 may be segmented by a developer to first send a relatively

simplified version of the object or shape to be rendered to the graphics pipeline, and

thereafter test the visibility of flag 110. If the visibility flag indicates that no part of the

shape was rendered, then the application program 102 may skip over subsequent

graphics calls that would further render the shape or object. In this way, otherwise

unnecessary computations may be saved by selective and carefull programming at the

application program 102 level.")

The limitation "for each of the plurality of draw packets that are deemed

potentially visible based on the comparison, electronically rendering one or more draw

packets deemed potentially visible" is taught by Brown (col 7, lines 13-25, as quoted

above, indicate that when a tested object is determined to be completely invisible, it can

be ignored from thereon in order to avoid unnecessary computation).

Regarding claim 2, the limitation "prior to rendering the one or more draw

packets, providing the plurality of draw packets to a command processor such that the

command processor checks for the set visibility query identifier for a draw packet based

on the comparison" is taught by Brown (col 7, line 57 - col 8, line 8, "In addition, and in

accordance with the teachings of the present invention, each object structure 130, 140,

and 150 may include a status value 138 for the visibility flag 110. When, for example,

the application program submits a given object for rendering, upon return (from the API)

the application program may check the status of the visibility flag 138 within the objects

data structure. If the visibility flag is clear, it informs the application program that no portion of the object was visible. If, however, the visibility flag is set, the application program then recognizes that at least a portion of the object was visible. Thus, an application program could utilize an object data structure of this format by rendering on set of the object's primitives, then checking the visibility flag 138. if the flag was set, then the application program could control the rendering o the object to render the remaining sets of object primitives. Otherwise, the application program could avoid any attempts at rendering the object.")

Regarding claim 3, the limitation "wherein prior to rendering the one or more draw packets the method further includes fetching a plurality of indices for the one or more draw packets based on the visibility query identifier" is taught by Brown (col 7, line 57 - col 8, line 8, as quoted in the claim 2 rejection, indicate that prior to rendering an object or portions of an object, a decision is made based on the visibility query identifier whether the object/portions are to be rendered. As shown in FIG 4, each object, which is rendered based on its associated visibility flag, identifies one or more associated primitives to be rendered, which may correspond to one or more draw packets, depending on how the developer chooses to divide the object geometry. Col 10, lines 11-21, "For example, the foregoing discussion has described the segmentation of a graphics scene into distinct objects for rendering. However, a developer or programmer may choose to segment a graphics scene in any of a variety of ways, consistent with the invention. Thus, rather than subdivide the graphics image into distinct objects, the developer may more generically partition or segment the image into distinct segments,

which do not necessarily correlate to objects. Nevertheless, the segmented graphics scene may be processed in a manner similar to that described above in connection with objects.")

Regarding claim 5, the limitation "prior to providing the plurality of draw packets to the command processor, stalling for a predetermined time interval to insure the setting of the visibility query identifier" is taught by Brown (col 10, lines 22-28, "Furthermore, it will be appreciated that some additional delay or latency is inserted into the operation of the application program as described herein. In this regard, additional time is required for the application to perform a check of the visibility flag, and when further information is to be rendered, initiate the rendering of that further information.")

Regarding claim 6, the limitation "wherein comparing each of the plurality of draw packets to the bounding volume includes at least one of the following: back-face culling, view frustum comparison, user-clip plane discard, and hierarchical-z discard" is taught by Brown (col 5, lines 7-12, "The clipping component 26 clips the vertex data so that only the vertex data relating to primitives that make up the portion of the view that will be seen by the user is kept for further processing. If the vertex data reveals that the entire primitive is outside the viewing window, then all other vertex data may be discarded or ignored." Brown is describing a view frustum comparison.)

Claim Rejections - 35 USC § 103

5.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6.   Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,259,461 B1 (hereinafter **Brown**) as applied to claim 3 above, and further in view of "ARB_occlusion_query" by R. Cunniff, M. Craighead, D. Ginsburg, K. Lefebvre, B. Licea-Kane, and N. Triantos (hereinafter **Cunniff**).

        Regarding claim 20, the limitation "further comprising managing a plurality of visibility query identifiers that define which of a plurality of hardware queries is to be updated across multiple driver contexts" is not explicitly taught by Brown (Brown doesn't discuss multiple driver contexts). However, this limitation is taught by Cunniff (page 6, 4th issue, "Are query objects shareable between multiple contexts? RESOLVED: No. Query objects are lightweight and we normally share large data across contexts. Also, being able to share query objects across contexts is not particularly useful." Although not explicitly stated, it is clear that query objects exist separately for hardware queries in multiple contexts, as it is noted they are not able to be shared across contexts.)

        Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Brown's visibility flag system to allow different contexts to maintain their visibility flag separately from one another, because there is no particular benefit to sharing them (as indicated by Cunniff), and because it is implicit in supporting multiple contexts that if there are multiple driver contexts executing 3D applications which would benefit separately from Brown's visibility flag system, each

would still retain a performance advantage with Brown's system when being executed

simultaneously as separate driver contexts.

7.   Claims 11-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over

US Patent 6,259,461 B1 (hereinafter **Brown**) in view of "Designing a PC Game Engine"

by L. Bishop, D. Eberly, T. Whitted, M. Finch, and M. Shantz (hereinafter **Bishop**).

        Regarding claim 11, the limitations "an apparatus for object based visibility

culling, the apparatus comprising: a processing unit; and a memory device storing

executable instructions such that the processing unit, in response to the executable

instructions" is taught by Brown (col 3, lines 36-56, as quoted in the claim 21 rejection,

indicate that a graphics pipeline used to process graphics data performs object based

visibility culling. It is implicit that the application program is stored in some memory

device.)

        The limitation "receives a plurality of draw packets" is taught by Brown (as

indicated in col 3, lines 36-56, as quoted in the claim 21 rejection, graphics data is

broken up into segments, i.e. the first segment, and others).

        The limitation "compares each of the plurality of draw packets to a bounding

volume object, wherein the bounding volume is a low resolution geometric

representation of a specific object" is taught by Brown(col 7, lines 13-25, "In similar

fashion, when an application program 102 is configured to display a graphics scene that

requires the rendering of relatively complex (i.e., computationally extensive) graphics

shapes or objects, the application program 102 may be segmented by a developer to

first send a relatively simplified version of the object or shape to be rendered to the

graphics pipeline, and thereafter test the visibility of flag 110. If the visibility flag

indicates that no part of the shape was rendered, then the application program 102 may

skip over subsequent graphics calls that would further render the shape or object. In

this way, otherwise unnecessary computations may be saved by selective and carefull

programming at the application program 102 level.")

The limitation "a low resolution geometric representation of a specific object

identified as geometry through which viewing definitions are defined" is partially taught

by Brown (Brown teaches making visibility determinations using low resolution

geometric representations, teaching that all objects may benefit from such a

simplification, rather than just "a specific object identified as geometry through which

viewing definitions are defined".) However, this limitation is taught by Bishop (section

"Interiors and portals", paragraph 2, "Portals draw themselves by adding a clipping

plane to the camera for each edge of the portal polygon. These planes are each

defined by a portal polygon edge and the camera center. Thus, each portal adds a new

frustum to the set of culling/clipping planes, as shown in Figure 5. Having pushed the

new clipping planes, the portal draws its adjoiner and then removes the clipping planes

it added to the camera. Geometry in a portal's adjoiner is thus culled and clipped to the

portal.")

Therefore it would have been obvious to one of ordinary skill in the art at the time

the invention was made to use Brown's visibility flag system to execute an application

program using Bishop's portals, using Brown's object simplification technique to reduce

the computational cost of using Bishop's portals (thus making a bounding volume object
which is "a low resolution geometric representation of a specific object identified as
geometry through which viewing definitions are defined").

The limitation "for each of the plurality of draw packets, if the draw packet is
deemed potentially visible, sets a visibility query identifier for the draw packet" is taught
by Brown (col 7, line 57 - col 8, line 8, as quoted in the claim 2 rejection, indicate that
prior to rendering an object or portions of an object, a decision is made based on the
visibility query identifier whether the object/portions are to be rendered, based on a
status value associated with that object or portion of object. Col 10, lines 11-21, as
quoted in the claim 3 rejection, indicate that although discussion is made in reference to
objects, any subdivision preferred by an application programmer may be used, which
could include every draw packet, if desired.)

The limitation "using at least one of a plurality of identifiers that defines which of a
plurality of hardware queries is to be updated" is taught by Brown (col 7, line 57 - col 8,
line 8, as quoted in the claim 2 rejection, indicate that each object (or draw packet, as
discussed above) is associated with a query.)

The limitation "renders one or more draw packets having the set visibility query
identifier" is taught by Brown (col 7, lines 13-25, as quoted above, indicate that when a
tested object is determined to be completely invisible, it can be ignored from thereon in
order to avoid unnecessary computation).

Regarding claim 12, the limitations are similar to those treated in the above
rejection(s) and are met by the references as discussed in claim 2 above.

Regarding claim 13, the limitations are similar to those treated in the above rejection(s) and are met by the references as discussed in claim 3 above.

Regarding claim 14, the limitation "when the visibility query identifier is not set, indicating that a particular draw packet is not visible, the command processor discards the draw packet" is taught by Brown (col 7, lines 13-25, as quoted in the claim 11 rejection, indicate that when a tested object is determined to be completely invisible, it can be ignored from thereon in order to avoid unnecessary computation. This is considered to be a discard.)

Regarding claim 15, the limitations are similar to those treated in the above rejection(s) and are met by the references as discussed in claim 5 above.

Regarding claim 16, the limitations are similar to those treated in the above rejection(s) and are met by the references as discussed in claim 6 above.

Response to Arguments

8.   Applicant's arguments, see pages 7-8, filed 6/10/10, with respect to 35 U.S.C. 101 rejections of claims 2, 3, 5, 6, 20, and 21, 35 U.S.C. 112, 1st paragraph rejections of claims 2, 3, 5, 6, 11-16, 20, and 21, and U.S.C. 112 2nd paragraph rejections of claims 5, 11-16 have been fully considered and are persuasive. Said rejections have been withdrawn.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT BADER whose telephone number is (571)270-3335. The examiner can normally be reached on M-T 9am-5pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ulka Chauhan can be reached on 571-272-7782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

ROBERT BADER
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